

**Updated Response to the Recommendations of the
Advisory Commission to Study the Consumer Price Index ***

Bureau of Labor Statistics

U.S. Department of Labor

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*Prepared in response to a request from the Honorable Christopher Shays, Chairman of the Subcommittee on Human Resources of the House Committee on Government Reform and Oversight.

U.S. Bureau of Labor Statistics, “Report from the Bureau of Labor Statistics for the House Budget Committee, U.S. Congress,” April 28, 1995.

Moulton, Brent R., “Bias in the Consumer Price Index: What is the Evidence?” *Journal of Economic Perspectives* 10(4): 159-77, 1996.

U.S. Bureau of Labor Statistics, “1998 CPI Revision,” reprint from the *Monthly Labor Review*, vol. 119, December 1996.

Abraham, Katharine G., “Testimony before the Subcommittee on Human Resources, House Committee on Government Reform and Oversight, U.S. Congress” April 30, 1997.

U.S. Bureau of Labor Statistics, “Measurement Issues in the Consumer Price Index,” response prepared for Jim Saxton, Chairman of the Joint Economic Committee, U.S. Congress, June 1997.

Abraham, Katharine G., John S. Greenlees, and Brent R. Moulton, “Working to Improve *Journal of Economic Perspectives*, vol.12, No. 1, Winter 1998, pp. 27-36.

U.S. Bureau of Labor Statistics, response prepared for Christopher Shays, Chairman of the Human Resources Subcommittee of the House Government Reform and Oversight Committee, U.S. Congress, March 31, 1998.

Executive Summary

Recommendation i

The BLS should establish a cost of living index (COLI) as its objective in measuring consumer prices.

The BLS has no fundamental disagreement with the commission about what the objective of the CPI should be, though we would emphasize that it is important to be clear about what precisely one means by a cost-of-living index. We will continue to exercise our judgment on the appropriateness of taking any specific step designed to bring the CPI closer to a true cost-of-living index, bearing in mind that it is crucial that any official statistic be based on rigorous, objective methods.

Recommendations ii, iii, and iv

The BLS should develop and publish two indexes: one published monthly and one published and updated annually and revised historically.

The timely, monthly index should continue to be called the CPI and should move toward a COLI concept by adopting a “superlative” index formula to account for change market baskets, abandoning the pretense of sustaining the fixed-weight Laspeyres formula.

The new annual COL index would use a compatible “superlative-index” formula and reflect subsequent data, updated weights, and the introduction of new goods (with their history extended backward).

The BLS does not accept the specifics of these recommendations but has initiatives underway to address upper-level substitution bias and the currency of the CPI market basket. Further research is needed to determine whether experimental techniques that approximate a superlative index would yield a more accurate monthly measure. We believe that hasty implementation of such techniques in the production of the monthly CPI without more complete testing would damage the credibility of our statistical system. The BLS has requested funds to support publication of a superlative index as a complement to the CPI beginning in 2002. Additionally, the BLS has requested funds to expand the Consumer Expenditure Survey sample size and develop enhanced

computer systems to support the timely introduction of more current spending data when the index weights are next updated. Finally, the BLS will announce a decision to make more frequent updates to expenditure weights in the near future.

Recommendation v

The BLS should change its procedure for combining price quotations by moving to geometric means at the elementary aggregates level.

The geometric mean formula for aggregating price quotations has been under investigation by the BLS over the past several years. On April 17, 1998 the BLS announced that the geometric mean formula will be used in the CPI in place of the current Laspeyres formula in all item strata except for selected shelter services, selected utilities and government charges and selected medical services. This change will be implemented with the CPI release for January 1999. Our best estimate is that the planned use of the geometric mean formula will lower the growth rate of the CPI by approximately 0.2 percentage point per year. A discussion of the decision and the rationale for the adoption of the geometric mean formula is presented in the paper entitled *Planned Change in the Consumer Price Index Formula* which is appended to this document.

Additional recommendation regarding expanded use of hedonic regressions for making quality adjustments.

The BLS agrees with the commission that the use of hedonic regression techniques in quality adjustment should be expanded. The BLS has used hedonic quality adjustment for selected CPI components for several years, has recently extended its use to additional components, and has requested funds for continued expansion.

Recommendation vi

The BLS should study the behavior of the individual components of the index to ascertain which components provide most information on the future longer-term movements in the index and which items have fluctuations which are largely unrelated to the total and emphasize the former in its data collection activities.

The BLS believes that this proposed redirection of data collection efforts would be inconsistent with the primary objective of the CPI to approximate changes in the cost of living. BLS thus does not plan to implement this recommendation.

Recommendation vii

The BLS should change the CPI sampling procedures to de-emphasize geography, starting first with sampling the universe of commodities to be priced and then deciding, commodity by commodity, what is the most efficient way to collect a representative sample of prices from which outlets, and only later turn to geographically clustered samples for the economy of data collection.

The BLS has no specific plans to implement changes to sampling procedures in connection with this recommendation. It is the current BLS practice to decide, commodity by commodity, what is the most efficient way to select samples. Samples are selected at the national level for some commodities, and BLS research will continue on the geographic structure underlying the CPI.

Recommendation viii

The BLS should investigate the impact of classification, that is item group definition and structure, on the price indexes to improve the ability of the index to fully capture item substitution.

The BLS instituted a new item structure for the CPI in January 1998 that was designed with an emphasis on its ability to capture consumer substitution. BLS will continue to work to improve the item structure within the normal framework of index revisions. Meanwhile, it will continue its research on substitution across item categories, focusing on the development of superlative measures of the cost of living.

Recommendation ix

There are a number of additional conceptual issues that require attention. The price of durables, such as cars, should be converted to a price of annual services, along the same lines as the current treatment of the price of owner-occupied housing. Also, the treatment of "insurance"

should move to an ex-ante consumer price measure rather than the currently used ex-post insurance profits based measure.

The BLS is sympathetic to the general spirit of this recommendation and is investigating the flow-of-services approach for automobiles. The flow-of-services approach does not, however, appear to be practicable for most durables due to the lack of widespread rental markets and the lack of data that would be needed for direct estimation of user cost. Automobile and tenants insurance policies currently are priced directly in the CPI but health insurance is not, due to difficulties in maintaining constant quality and coverage of risk over time.

Recommendation x

The BLS needs a permanent mechanism for bringing outside information, expertise, and research results to it. At the request of the BLS, this group should be organized by an independent public professional entity and would provide BLS an improved channel to access professional and business opinion on statistical, economic and current market issues.

The BLS has in place many mechanisms for bringing in outside information, expertise, and research results from business, labor, academic researchers, professional economic/statistics organizations, and other Federal statistical agencies. The BLS will continue to actively solicit such help.

Recommendation xi

The BLS should develop a research program to look beyond its current "market basket" framework for the CPI.

The BLS has no specific plans to implement this recommendation. Measurement of changes in 'quality of life' may require too many subjective judgments to furnish an acceptable basis for adjusting the CPI. Furthermore, it is unclear whether 'quality of life' valuations are an appropriate part of an index of change in the price of market goods and services.

Recommendation xii

The BLS should investigate the ramifications of the embedded assumption of price equilibrium and the implications of it sometimes not holding.

The BLS agrees with this recommendation, has made considerable progress in reducing reliance on quality adjustment methods that require strong price equilibrium assumptions, and plans to continue research and progress in this area.

Recommendation xiii

The BLS will require a number of new data collection initiatives to make some progress along these lines. Most important, data on detailed time use from a large sample of consumers must be developed.

The BLS agrees that measures of time use have research value and currently is undertaking a study of time use, but considers such studies to be supplementary to rather than a part of the CPI's particular cost of living framework.

I. Introduction

This paper on the Consumer Price Index (CPI) has been prepared in response to an April 29, 1998 request from Representative Christopher Shays, Chairman of the Subcommittee on Human Resources of the House Committee on Government Reform and Oversight, to Katharine Abraham, Commissioner of the Bureau of Labor Statistics (BLS), for an update on the BLS responses to the various recommendations in the report of the Advisory Commission to Study the CPI (the Boskin Commission).¹

In a June 1997 paper written in response to Representative Jim Saxton, Chairman of the Joint Economic Committee, the BLS summarized the advisory commission report and set out its views of the analysis and recommendations provided therein. In this paper, after a brief review of background on the recommendations of the Boskin report, we provide our response to the recommendations, which builds on the response prepared for Representative Saxton.

The commission report compares the U.S. CPI to a hypothetical ideal measure of the change in the cost of living and concludes that in several respects the CPI is biased relative to this standard. The categories of bias discussed by the commission include: substitution bias (due in large part to the fixed-weight nature of the index), outlet bias (which may occur if the index does not account for the benefits to consumers from switching to discount outlets), quality change bias (which results when the value of quality differences between the goods priced in two consecutive periods cannot be accurately measured and deducted from the accompanying price difference between the goods), and new product bias (due to the failure to reflect adequately the value to consumers of new products that are introduced into the market).

The advisory commission emphasizes that the U.S. economy is exceedingly complex and dynamic, with the available offerings of goods and services constantly changing. It also acknowledges that index number construction is a complex and difficult task. It recommends that

¹ U.S. Senate, Committee on Finance, *Final Report of the Advisory Commission to Study the Consumer Price Index*. Print 104-72, 104 Cong., 2 sess., (Washington, D.C., Government Printing Office, 1996).

the BLS make several changes in the methods used in constructing the CPI, including more frequent updates of the market basket and expenditure information required by the index and the use of formulas more consistent with the theoretical cost-of-living concept. The focus of public attention has been on the commission's short-run recommendations: explicit adoption of a cost-of-living index as the measurement objective of the CPI, replacement of the current index by two indexes—a monthly index that takes account of the changing market basket and a second annual index calculated using a 'superlative' formula and subject to revision—and use of geometric means for aggregating elementary price quotes.

These short-run recommendations primarily address the issue of substitution bias. The commission also makes several intermediate and longer run methodological and research recommendations. Although some of these are related to outlet, quality change, and new goods biases, the commission does not present a specific or comprehensive program of improvements to solve those difficult potential problems.

II. Other Background Materials

Over the past several years the BLS has released numerous documents presenting its views on the measurement issues involved in production of the CPI. Among the most important of these documents are²:

U.S. Bureau of Labor Statistics, 'Anatomy of Price Change,' reprint from the *Monthly Labor Review*, vol. 116, December 1993. This issue of the *Monthly Labor Review* was dedicated to a series of articles on CPI measurement problems.

² Other recent, but more narrowly focused, BLS papers relating to issues discussed in the Advisory Commission report include Paul A. Armknecht, Brent R. Moulton, and Kenneth J. Stewart, "Improvements to the food-at-home, shelter and prescription drug indexes in the U.S. Consumer Price Index," Bureau of Labor Statistics working paper 263, February 1995; John S. Greenlees, "Expenditure Weight Updates and Measured Inflation," paper presented at the Third Meeting of the International Working Group on Price Indices, Voorburg, Netherlands, April 16-18, 1997; Brent R. Moulton and Karin E. Moses, "Addressing the Quality Change Issue in the Consumer Price Index," *Brookings Papers on Economic Activity*, 1997(1): 305-366; and Paul A. Armknecht, Walter F. Lane., and Kenneth

Abraham, Katharine G., "Testimony before the Senate Finance Committee, U.S. Congress," March 13, 1995. This testimony describes the CPI, how it is constructed, and its relationship to a cost-of-living index.

concerning the relationship between the CPI and a cost-of-living measure, potential biases in the CPI, and BLS research into potential solutions to these problems.

Moulton, Brent R., "Bias in the Consumer Price Index: What is the Evidence?" *Journal of Economic Perspectives* 10(4): 159-77, 1996. This article summarizes and comments on several estimates of bias in the CPI.

U.S. Bureau of Labor Statistics, "1998 CPI Revision," reprint from the *Monthly Labor Review*, vol. 119, December 1996.. This issue of the Monthly Labor Review was dedicated to a series of articles on the 1998 CPI Revision.

Abraham, Katharine G., "Testimony before the Subcommittee on Human Resources, House Committee on Government Reform and Oversight, U.S. Congress" April 30, 1997. This testimony summarizes the actions the Bureau has taken and will be taking to improve the accuracy of the Consumer Price Index.

U.S. Bureau of Labor Statistics, "Measurement Issues in the Consumer Price Index," response prepared for Jim Saxton, Chairman of the Joint Economic Committee, U.S. Congress, June 1997. This was the Bureau's most comprehensive response to date to the recommendations made by the Advisory Commission to Study the CPI.

J. Stewart, "New Products and the U.S. CPI," in Timothy Bresnahan and Robert J. Gordon, eds., *The Economics of New Goods*, University of Chicago Press, Chicago, 1997.

Abraham, Katharine G., John S. Greenlees, and Brent R. Moulton, "Working to Improve the *Journal of Economic Perspectives*, vol.12, No. 1, Winter 1998, pp. 27-36. This paper comments on the Advisory Commission's report and summarizes recent and planned improvements in the CPI.

U.S. Bureau of Labor Statistics, response prepared for Christopher Shays, Chairman of the Human Resources Subcommittee of the House Government Reform and Oversight Committee, U.S. Congress, March 31, 1998. This letter describes improvements in the CPI between April 1997 and March 1998, as well as future CPI improvement plans.

The remaining sections of this paper present the recommendations of the Boskin Commission along with the BLS responses. The responses are based on the 1997 paper prepared for Representative Saxton, updated and expanded where appropriate.

III. Short Run Recommendations³

Recommendation i. The BLS should establish a cost of living index (COLI) as its objective in measuring consumer prices.

The advisory commission's report begins with one overarching recommendation: "The BLS should establish a cost of living index (COLI) as its objective in measuring consumer prices." The BLS basically concurs with this; indeed, the BLS long has said that it operates within a cost-of-living framework in producing the CPI. That framework has guided, and will continue to guide, operational decisions about the construction of the index.⁴ Putting things slightly differently, if the BLS staff or other technical experts knew how to produce a true cost-of-living index on a

³ The advisory commission uses two different methods for numbering their recommendations. See U.S. Senate, Committee on Finance, *Final Report*, pp. 2-3 and pp. 49-55. Herein we follow the numbers and text from pp. 2-3.

⁴ Robert Gillingham, "A Conceptual Framework for the Consumer Price Index," *Proceedings of the American Statistical Association 1974 Business and Economics Section*, (Washington, D.C., American Statistical Association, 1974); U.S. Bureau of Labor Statistics, *BLS Handbook of Methods*, Bulletin 2134-2, 1984, p. 4; *BLS Handbook of Methods*, Bulletin 2285, 1988, p. 155; *BLS Handbook of Methods*, Bulletin 2414, 1992, p. 177; *BLS Handbook of Methods*, Bulletin 2490, 1997, p. 170.

monthly production schedule, that would be what we would produce. While the BLS broadly agrees with the commission that the objective of our CPI program ought to be to produce a cost-of-living index, it is important to note that there are many different cost-of-living indexes that could be taken as the CPI's target. The cost-of-living index approximated by the CPI answers the following question: "What is the minimum change in expenditure that would be required in order to leave the average consumer unit indifferent (or as well off) between a specified reference period's prices and a comparison period's prices?"⁵ Consumers' well-being depends on many aspects of life other than market goods and services, e.g., environmental quality and amenities (such as clean air and low crime), goods provided through taxes (such as national defense and fire protection), health status, and future consumption goals (which depend on both current and expected future income, and savings). The BLS defines the scope of the CPI, however, to include only market goods and services or government-provided goods for which explicit user charges are assessed. The cost-of-living index approximated by the CPI is, therefore, a subindex of the all-encompassing cost-of-living concept, specifically a subindex that is conditional on the excluded factors that affect consumer well-being, such as health status and the quantity and quality of government-provided goods and services.⁶

Because the cost-of-living concept does not imply a single all-purpose cost-of-living index, the BLS will continue to need to make choices about the specific issues of formula, coverage, and index construction. One criterion in making these choices is the need to employ methods that are appropriate for a statistical agency. Those methods must be rigorous and objective rather than speculative, minimizing the role of arbitrary BLS judgments.⁷ We recognize, for example, that changes in disease incidence or public safety levels affect consumer well-being in

⁵ An alternative would be to formulate the cost-of-living index in terms of required income rather than required expenditure. This formulation would imply the inclusion of income- and wage-based taxes. See, for example, Robert A. Pollak, "The Treatment of Taxes in the Consumer Price Index," in *The Theory of the Cost-of-Living Index* (New York, Oxford University Press, 1989), pp. 193-199, and Robert Gillingham and John S. Greenlees, "The Impact of Direct Taxes on the Cost of Living," *Journal of Political Economy*, 95, no. 4, August 1987, pp. 775-796.

⁶ See Pollak, *Theory of the Cost-of-Living Index*, and Gillingham, "A Conceptual Framework."

ways that are difficult or even impossible to quantify using methods that meet these standards. We also believe, however, that adhering to the standards is critical to maintaining the credibility of our official statistics. An important part of the BLS's responsibility, therefore, is to describe for data users the scope and theoretical assumptions of its price measures, as well as any necessary caveats with respect to their use.

In summary, the BLS has no fundamental disagreement with the commission about what the objective of the CPI should be, though we would emphasize that it is important to be clear about what precisely one means by a cost-of-living index. We will continue to exercise our judgment on the appropriateness of taking any specific step designed to bring the CPI closer to a true cost-of-living index, bearing in mind that it is crucial that any official statistic be based on rigorous, objective methods.

Recommendation ii. The BLS should develop and publish two indexes: one published monthly and one published and updated annually and revised historically.

Recommendation iii. The timely, monthly index should continue to be called the CPI and should move toward a COLI concept by adopting a "superlative" index formula to account for changing market baskets, abandoning the pretense of sustaining the fixed-weight Laspeyres formula.

Recommendation iv. The new annual COL index would use a compatible "superlative-index" formula and reflect subsequent data, updated weights, and the introduction of new goods (with their history extended backward).

Because these three recommendations address methods for dealing with the upper-level substitution bias problem, we will discuss them together.

⁷ The BLS has elsewhere (see, for example, Abraham et al, "Working to Improve the Consumer Price Index") made this point in the context of adjusting for new product innovations.

Some index formulas, known as “superlative” indexes, have been shown theoretically to be closer to the cost-of-living concept than measures like the CPI that track the cost of a fixed basket.⁸ The major superlative indexes are the Fisher and Törnqvist measures. Using these formulas, one can construct an index that accounts for the changes that consumers make in the quantities of the goods and services they consume in response to changes in relative prices. By substituting goods that have become relatively cheaper for those that have become relatively more expensive, consumers can achieve the same standard of well-being for less than the cost of purchasing their original market basket. Because the CPI holds the market basket fixed at base period quantities, it incurs substitution bias by putting too much weight on the relatively more expensive items from which consumers have shifted away. The superlative indexes, because they adjust for changes in consumer expenditures, tend to avoid this type of bias. The superlative indexes do, however, require information on the current period market basket. Because it takes time to collect and process consumer expenditure data, a superlative index can be produced only with a time lag.⁹

The commission recommends that the BLS should move to a trailing Törnqvist formula for the monthly index.¹⁰ By this they mean a geometric mean formula in which the weights are lagged expenditure shares and are updated each year. The resulting measure would not be a true superlative index, although it would be intended to provide a feasible real-time approximation to a Fisher Ideal or Törnqvist index. The commission also recommends that the BLS develop a new annual index that is calculated using a true superlative formula and is subject to revision.

The BLS continues to investigate several experimental indexes that are designed to address consumer substitution across item categories. These include superlative formulas which,

⁸ See W. E. Diewert, “Exact and Superlative Index Numbers,” in Diewert and Nakamura, eds., *Essays in Index Number Theory*, Volume 1, pp. 223-252.

⁹ Whereas the BLS collects and processes CPI price data monthly, most CPI expenditure data are drawn from the Consumer Expenditure Survey (CEX) household interviews, which are conducted quarterly. Fully edited expenditure data for a given year are not available until late in the following year. As is described below, the BLS plans to take steps to expedite the processing of the CEX data, but updating of expenditure weights on a monthly basis would be prohibitively expensive.

¹⁰ U.S. Senate, Committee on Finance, *Final Report*, p. 50.

due to the need for current expenditure data, create indexes that must be produced with a lag, as well as new methods that may approximate the superlative formula and allow the production of indexes in a more timely fashion.

The timeliness of the CPI might be maintained by using some form of an approximation to a superlative index. The commission's proposed trailing Tornqvist formula, however, has been shown to produce price changes that systematically understate the increases in the cost of living, as measured by the superlative formulas.¹¹ More recently, other approximation strategies have been proposed, including a method based on the "constant elasticity of substitution" (CES) formula.

¹² But such an approximation would not track the superlative indexes precisely during some years an index based on an approximation would rise more than the superlative index, during other years it would rise less. This feature raises the issue of whether such an index subsequently would need to be revised once the data were available to calculate the superlative index. Another issue that needs to be addressed in considering use of approximations is the issue of estimating the subaggregate indexes, i.e., the indexes for intermediate levels of aggregation, such as for food or transportation. Some of these indexes may consist of item categories that are relatively close substitutes fresh fruits, for example, consists of apples, bananas, oranges, and other fruits whereas others may consist of item categories that probably are not close substitutes medical professional services, for example, includes physicians, dentists, and eye care. Because the CES function is based on a single elasticity parameter which is assumed to be the same for all items, while consumers' willingness to substitute is likely to vary across categories of items, further research is needed to determine whether a simple approximation such as the CES would produce sensible

¹¹ See Ana M. Aizcorbe, Robert A. Cage, and Patrick C. Jackman, "Commodity Substitution Bias in Laspeyres Indexes: Analysis Using CPI Source Data for 1982-1994," paper presented at the Western Economic Association International Conference in San Francisco, July 1996 (Washington, D.C., Bureau of Labor Statistics); and Matthew D. Shapiro and David W. Wilcox, "Alternative Strategies for Aggregating Prices in the CPI," Federal Reserve Bank of St. Louis *Review*, May/June 1997, pp. 113-125.

¹² See Shapiro and Wilcox, "Alternative Strategies." The CES formula that they proposed was originally derived by P.J. Lloyd, "Substitution Effects and Biases in Nontrue Price Indices," *American Economic Review*, vol. 65, June 1975, 301-13, and was suggested by BLS staff as a method for approximating a superlative index without current expenditure data.

approximations for all of these subaggregates. Also, the use of an index based on statistical approximation might be difficult to interpret and explain to users of the data. We believe we would gain little, and possibly do much damage to the credibility of our statistical system, if we were to move hastily to adopt untested techniques for producing the official CPI.

The BLS has requested funds to improve the accuracy and timeliness of the CPI, and an important part of this request will support the production of a superlative index, produced to a greater degree of accuracy than is now possible. The BLS plans to begin publishing this measure in 2002. Selection of a specific form for the index requires that several design issues be resolved. Most fundamental will be the choice between production of an annual index with a lag and production of a monthly or quarterly index that is subject to revision as new annual expenditure data became available. The BLS also will have to address more technical issues such as functional form, estimation of expenditure weights, and whether substitution across areas will be treated in the same way as substitution across item categories. In the interim, the superlative measures we currently produce can be used to estimate the magnitude of the upper level substitution bias in the CPI, and indeed are the best measures currently available for this purpose.

Another key aspect of these commission recommendations is the annual updating of expenditure weights. Historically, the CPI expenditure weights have been updated at roughly ten-year intervals, corresponding to the availability of decennial Census population data and (prior to the 1980s) of Consumer Expenditure Survey (CEX) data. Most recently, in January 1998 the CPI was updated using the 1990 Census and 1993-95 spending patterns. The BLS has indicated, however, that future updates will take place more frequently. A decision concerning the appropriate interval between weight updates will be made soon, based on additional study both of the importance of employing current spending weights and of the 'chain drift' distortions that potentially could result from too-frequent weight changes. In this regard, the BLS has requested funds for an enhanced CEX sample size and for computer system enhancements that will permit the introduction of more current spending data whenever the weights are updated.

The BLS also is evaluating the production of a historical research series that would be revised as new methodological improvements are developed and implemented in the official index. Such an index could be of value to research economists and others concerned with past movements in prices, income, productivity, and other economic variables.

In summary, the BLS does not accept the specifics of these recommendations but has initiatives underway to address upper-level substitution bias and the currency of the CPI market basket. Further research is needed to determine whether the experimental techniques under investigation for producing the official monthly CPI would yield a more accurate measure. We believe that hasty implementation of such techniques without more complete testing would damage the credibility of our statistical system. The BLS has requested funds to support publication of a superlative index as a complement to the CPI beginning in 2002. Additionally, the BLS has requested funds to expand the Consumer Expenditure Survey sample size and develop enhanced computer systems to support the timely introduction of more current spending data when the index weights are next updated. Finally, the BLS will announce a decision to make more frequent updates to expenditure weights in the near future.

Recommendation v. The BLS should change its procedure for combining price quotations by moving to geometric means at the elementary aggregates level.

To address lower-level substitution bias, the commission suggested the adoption of a geometric mean formula for aggregating price quotations, a formula that has been under investigation by the BLS over the past several years. On April 17, 1998 the BLS announced that the geometric mean formula will be used in the CPI in place of the current Laspeyres formula in all item strata except for selected shelter services, selected utilities and government charges and selected medical services.¹³ This change will be implemented with the CPI release for January

¹³ In his April 29, 1998 testimony before the Human Resources Subcommittee, Robert Gordon, a member of the advisory commission, indicated that the commission members were “supportive to the factors that the BLS cited” in retaining the current formula for some strata.

1999. Our best estimate is that the planned use of the geometric mean formula will lower the growth rate of the CPI by approximately 0.2 percentage point per year. A discussion of the decision and the rationale for the adoption of the geometric mean formula is presented in the paper entitled 'Planned Change in the Consumer Price Index Formula' which is appended to this document.

Additional recommendation regarding expanded use of hedonic regressions for making quality adjustments.

The advisory commission report did not contain an explicit recommendation concerning the use of hedonic regressions, but the commission members later emphasized their support for increased use of this approach to quality adjustment.¹⁴ This is, in fact, a critical element of BLS current practice and future plans. For several years, hedonic quality adjustments have been used in the CPI apparel and rent indexes. Starting in January 1998, the hedonic model developed and used in the Producer Price Index for adjusting computer prices has been employed in the Personal Computers and Peripheral Equipment category of the CPI. New hedonic research is underway on video and audio equipment data. Most importantly, funds have been requested to support ongoing collection of product price and characteristic data, focused on consumer durable items. It is expected that this information will enable the BLS to expand significantly the use of hedonic quality adjustment methods in future years.

In summary, the BLS agrees with the commission that the use of hedonic regression techniques in quality adjustment should be expanded. The BLS has used hedonic quality adjustment for selected CPI components for several years, has recently extended its use to additional components, and has requested funds for continued expansion.

¹⁴ Michael J. Boskin, Ellen R. Dulberger, Robert J. Gordon, Zvi Griliches, and Dale W. Jorgenson, "Consumer Prices, The Consumer Price Index, and The Cost of Living," *Journal of Economic Perspectives*, vol. 12, Winter 1998, p. 14.

IV. Intermediate Run Recommendations

Recommendation vi. The BLS should study the behavior of the individual components of the index to ascertain which components provide most information on the future longer-term movements in the index and which items have fluctuations which are largely unrelated to the total and emphasize the former in its data collection activities.

Elsewhere in their report, the commission emphasizes that the objective of the CPI should be to measure changes in the cost of living. That is, the CPI for 1998 should measure change in the cost of living during 1998. This recommendation, however, suggests that data collection activities should focus on a different objective, namely to provide information on the future longer-term movements of individual prices or the index as a whole. Forecasting inflation is a widespread and important use of the CPI, of course, but one that is conceptually distinct from the measurement of cost-of-living changes. If prediction of future inflation, or the measurement of inflationary pressure, were the measurement objective of the CPI, this might imply different choices with respect to the formulas and weights used in construction of the index, as well as with respect to the allocation of the sample. The commission, however, emphasizes the use of the CPI as a measure of past and contemporaneous changes in the cost of living in choosing the index formulas and weights, on the one hand, while emphasizing the uses of the CPI in forecasting future price movements in determining the sample allocation, on the other. This appears to be an internally inconsistent strategy.

It is important to recognize that the BLS determines and allocates its data collection resources based on rigorous statistical considerations. Sample resources for the CPI are allocated between the two major price surveys, Commodities and Services (C&S) and Housing, according to the relative importance and variability of the survey estimators for each component, while taking into account the relative costs of each survey. The sample for the C&S component of the CPI is designed to allocate resources systematically among major item groups and sample cities, utilizing models to minimize the sampling variance of estimated price change over a six-month

interval, as measured by the all items (less shelter) national CPI, subject to cost and sample coverage constraints. Solution allocations among items, outlets, and cities thus strike a balance with respect to the contributions of components of sampling variability by sample items, their relative importance with respect to the total consumer budget, and the relative cost of data collection and processing, while keeping within the cost and coverage constraints of the program.¹⁵

In its discussion of this recommendation, the commission suggests that resources devoted to the sample for bananas, a perishable fresh fruit whose price-change sampling variability has been estimated to be substantial, but whose price fluctuations are not systematically related to the underlying trend movements of the CPI, would be better allocated to surgical treatments, consumer electronics, and communication services.¹⁶ The potential for saving resources by reducing collection of data for items like bananas is fairly limited because the marginal cost of collection and processing is quite small—the stores are already being visited to collect other grocery items and very little analysis is required after collection. Moreover, because the C&S sample has been allocated to minimize the variance of six-month price change, a reallocation of resources away from any item with a high sampling variance toward other items necessarily would diminish the reliability of short-term movements in the all items index.

In summary, the BLS believes that this proposed redirection of data collection efforts would be inconsistent with the primary objective of the CPI—to approximate changes in the cost of living. BLS thus does not plan to implement this recommendation.

Recommendation vii. The BLS should change the CPI sampling procedures to de-emphasize geography, starting first with sampling the universe of commodities to be priced and then deciding, commodity by commodity, what is the most efficient way to collect a representative

¹⁵ See S.G. Leaver, W.H. Johnson, R.M. Baskin, S. Scarlett, and R. Morse, “Commodities and Services Sample Redesign for the 1998 Consumer Price Index Revision,” *Proceedings of the Survey Research Methods Section, American Statistical Association*, 1996, pp. 239-244.

¹⁶ U.S. Senate, Committee on Finance, *Final Report*, p. 51.

sample of prices from which outlets, and only later turn to geographically clustered samples for the economy of data collection.

Because geographical coverage impinges on many aspects of the CPI data collection and index estimation process, the practical meaning of this recommendation is somewhat unclear. As emphasized above, the allocation of the CPI sample has a rigorous statistical basis. By the same token, the importance of the geographic structure underlying the CPI makes it a continuing subject of BLS research, with the goal of improving the efficiency of CPI data collection activities and thereby the accuracy of the index.

Deciding, commodity by commodity, what is the most efficient way to collect a sample has been and will continue to be the standard BLS practice. In several cases, for example, postage and used cars, the BLS currently collects data on a national level. In most cases, however, it is not possible to select samples of specific items at the national level because of the lack of a national list (or *frame*) of items to sample, together with the sales volume information needed to determine the probabilities of selection. Moreover, if specific items were selected nationally, there would not usually be a feasible way to determine whether a selected item was, in fact, carried by any particular sample retail outlet. These considerations have led the Bureau to do sampling of items for pricing locally, by first selecting the urban area, then the outlet, and finally the specific item within the outlet. This method helps to ensure that the sample of items is timely and representative. The BLS is currently investigating potential uses of point-of-sale (scanner) data which are available from private vendors, and in the future it might be possible in some cases for the BLS to use such data to draw national samples of items.¹⁷

In summary, the BLS has no specific plans to implement changes to sampling procedures in connection with this recommendation. It is the current BLS practice to decide, commodity by commodity, what is the most efficient way to select samples. Samples are selected at the national

¹⁷ See Ralph Bradley, Bill Cook, Sylvia G. Leaver, and Brent R. Moulton, "An Overview of Research on Potential Uses of Scanner Data in the U.S. CPI," paper presented at the Third Meeting of the International Working Group on Price Indices, Voorburg, Netherlands, April 16-18, 1997 (Washington, D.C., Bureau of Labor Statistics).

level for some commodities, and BLS research will continue on the geographic structure underlying the CPI.

Recommendation viii. The BLS should investigate the impact of classification, that is item group definition and structure, on the price indexes to improve the ability of the index to fully capture item substitution.

The BLS introduced a new item structure for the CPI with the release of data for January 1998.¹⁸ The ability of the index to capture consumer substitution was one of the prominent factors that was considered in developing the new item classification. In putting together the item classification, the BLS also tried to see that [the strata] formed natural groups, as consumers would view them. For example, using the consumer view, items within the same stratum should have some affinity, such as substitutes (butter and margarine), or complements (washers and dryers).¹⁹

The commission points to some examples of potential consumer substitutions which cross item boundaries, such as on-line news services which compete with newspapers, automobile purchases with leases, and drugs with surgical procedures they replace,²⁰ arguing that in these cases direct price comparisons are needed so that the full substitution effect can be measured.²⁰ The BLS is sympathetic to the commission's concern, and will continue to work to improve the CPI item structure.²¹ It seems to us, however, that no feasible item classification system would completely capture the current and possible future developments in consumer substitution behavior. Moreover, one must acknowledge that because any item classification structure relies

¹⁸ See Walter Lane, "Changing the Item Structure of the Consumer Price Index," *Monthly Labor Review* vol. 119 no. 12, December 1996, 18-25 for a discussion of the design of the item structure.

¹⁹ Lane, "Changing the Item Structure," p. 22.

²⁰ See U.S. Senate, Committee on Finance, *Final Report*, p. 52.

²¹ The January 1997 consolidation of three CPI strata—hospital room, other inpatient services, and outpatient services—into one hospital services stratum was designed in part to capture substitution among those three settings for treatment provision. The inclusion of new cars and new trucks in a single new vehicles stratum is an example of a similar change taking place as part of the January 1998 introduction of the revised CPI market basket.

on a combination of expert judgment and quantitative evidence, all such structures are by nature somewhat arbitrary and therefore arguable. Perhaps most important, it does not seem to us that the item classification system is necessarily the most significant impediment to measuring the effects of these substitutions. The more fundamental issue is the need to develop systematic methods for identifying the substitution and accounting for differences in quality between the substituted items.

In summary, the BLS instituted a new item structure for the CPI in January 1998 that was designed with an emphasis on its ability to capture consumer substitution. BLS will continue to work to improve the item structure within the normal framework of index revisions. Meanwhile, it will continue its research on substitution across item categories, focusing on the development of superlative measures of the cost of living.

Recommendation ix. There are a number of additional conceptual issues that require attention. The price of durables, such as cars, should be converted to a price of annual services, along the same lines as the current treatment of the price of owner-occupied housing. Also, the treatment of “insurance” should move to an ex-ante consumer price measure rather than the currently used ex-post insurance profits based measure.

When the BLS adopted the rental equivalence approach to pricing housing services in 1983, BLS staff were aware that the same conceptual issues arise in the pricing of other consumer durables.²² In principle the CPI is intended to measure the cost of consuming goods and services, and durable goods provide a flow of services over time rather than immediate consumption. To implement a flow-of-services approach, however, requires information either on the costs that would be associated with renting the durable asset or the user cost associated with holding the durable asset. In the case of housing, the existence of rental markets makes it relatively easy to

²²See “Changing the CPI Homeownership Method to Rental Equivalence,” *CPI Detailed Report*, Bureau of Labor Statistics, January 1983, pp. 3-17.

implement the former approach, commonly referred to as the rental equivalence approach, while the long life of housing assets and the likelihood of price appreciation made the standard asset price approach uniquely problematic. During the mid-1980s, BLS researchers investigated the potential use of automobile leasing data to price automotive services, but at that time concluded that the auto leasing markets were not sufficiently developed to support a leasing equivalence approach to index construction. Subsequently, automobile leasing has grown to the point that in 1998 an automobile leasing stratum was added to the CPI market basket. Currently BLS researchers are reexamining the flow-of-services approach for automobiles, possibly using a leasing equivalence methodology. For durables other than automobiles, the lack of widespread rental markets as well as the lack of data needed for direct estimation of user cost suggest that the flow of services approach may not be practicable.

The commission recommends that the BLS move the CPI for insurance to an *ex ante* consumer price measure from the currently used *ex post* insurance profit based measure.”The current CPI for health insurance does not directly price policies purchased by consumers.²³ Instead, an indirect approach to measuring the price of a policy is used; the price is seen as deriving from the services provided by the insurer and the value of benefits paid to providers of health care. The BLS prices these two parts separately, obtaining from insurers information on retained earnings to measure changes in the value of the insurance service component, and using the price indexes in the CPI medical care component to measure changes in the cost of the health benefits paid to providers. It is possible that direct pricing of health insurance policies would have the virtue of automatically reflecting cost-reducing innovations in the treatment of medical problems (such as the substitution of less-costly outpatient procedures). The countervailing difficulty, however, is that health insurance policies can increase or decrease in price due to changes in coverage or in the characteristics of the covered populations, and these changes may be very difficult to observe or adjust for in the index.

²³ Automobile and tenants insurance policies are priced directly in the CPI.

The current CPI approach was adopted in 1964. Prior to that the CPI collected the price of the most widely-sold community-rated Blue Cross/Blue Shield policy. That approach was dropped, however, when it became evident that the quality of the policies was changing in ways for which it was difficult to adjust the policy price. In 1984-85 the Bureau experimented with the direct pricing of a sample of health insurance policies but the experiment was terminated because it again proved too difficult to maintain constant quality and coverage of risk over time. The BLS recognizes the importance of the health insurance price movements to consumers as well as to policy makers and will continue to search for ways to overcome the obstacles to accurate adjustment for changes in policy characteristics.²⁴

In summary, the BLS is sympathetic to the general spirit of this recommendation and is investigating the flow-of-services approach for automobiles. The flow-of-services approach does not, however, appear to be practicable for most durables due to the lack of widespread rental markets and the lack of data that would be needed for direct estimation of user cost. Automobile and tenants insurance policies currently are priced directly in the CPI but health insurance is not, due to difficulties in maintaining constant quality and coverage of risk over time.

Recommendation x. The BLS needs a permanent mechanism for bringing outside information, expertise, and research results to it. At the request of the BLS, this group should be organized by an independent public professional entity and would provide BLS an improved channel to access professional and business opinion on statistical, economic, and current market issues.

The BLS already has in place many mechanisms for bringing in outside information, expertise, and research results. Business and labor research advisory committees meet regularly with BLS staff and management and have long been a source of outside information and

²⁴ For discussions of past BLS research on the direct pricing of health insurance policies, and on the user-cost and leasing-equivalence approaches to pricing of automobile services, see Paul A. Armknecht and Daniel H. Ginsburg, "Improvements in Measuring Price Changes in Consumer Services: Past, Present, and Future," in Zvi Griliches, ed., *Output Measurement in the Service Sectors*, (Chicago, University of Chicago Press, 1992).

expertise. A price research division has been a part of the price index programs since 1965, and much of the discussion of CPI bias has been based upon the results of research conducted by BLS staff. BLS economists and statisticians routinely solicit opinions from outside researchers by presenting research papers at conferences and submitting them for publication at peer reviewed journals. Academic researchers are regularly invited to present their research findings to BLS staff in seminars. The Bureau's American Statistical Association-National Science Foundation-BLS fellowship program brings in scholars for extended on-site research projects. The BLS has funded research by academic economists when research by experts was needed to solve difficult measurement problems.²⁵

The BLS agrees that continued input from outside researchers is useful. For the past several years researchers at the National Bureau of Economic Research (NBER) Summer Institute have devoted specific sessions to index number issues and BLS staff have been regular participants. Earlier this year BLS asked several outside researchers to review the decision to adopt the geometric mean formula in the CPI. In addition, the BLS has participated with the Bureau of Economic Analysis (BEA) and the NBER in a project addressing the measurement of output and prices for medical care. Currently the BLS is pursuing a project with outside researchers regarding some of the conceptual issues underlying the construction of the CPI and its use for escalation.

In summary, the BLS has in place many mechanisms for bringing in outside information, expertise, and research results from business, labor, academic researchers, professional economic/statistics organizations, and other Federal statistical agencies. The BLS will continue to actively solicit such help.

²⁵ See, e.g., Pollak, *Theory of the Cost-of-Living Index*; and David M. Cutler, Mark McClellan, Joseph P. Newhouse, and Dahlia Remler, "Are Medical Prices Declining?" National Bureau of Economic Research, Working Paper Number 5750, September 1996.

V. Longer Run Recommendations

Recommendation xi. The BLS should develop a research program to look beyond its current “market basket” framework for the CPI.

This recommendation suggests that the BLS should develop research programs exploring quality of life issues such as time-saving benefits of new medical procedures and new communication devices, and changes in the social or natural environment caused by rising crime or new diseases. Because these things clearly affect our standard of living, a complete accounting of U.S. economic progress would include them.

We do, however, have a reservation about this recommendation. Implicit in this recommendation is a suggestion that the BLS should adjust the CPI for these effects. Valuing changes in time allocation or in the general social environment may well require too many subjective judgments to furnish an acceptable basis for adjusting the CPI. Furthermore, arriving at a comprehensive measure of changes in the quality of life would be quite difficult, yet making such adjustments in only a few selected cases could make the CPI less accurate if these cases are not representative. Finally, it is unclear whether quality of life valuations really belong in an index used for the escalation of payments and adjustment of tax parameters. For example, the advisory commission suggests that the CPI rent index should have made a quality adjustment for changes in climate as renters migrated to the south.²⁶ Such a quality-of-life adjustment, however, is properly viewed as out of scope under the current definition of the CPI.²⁷ Most of the uses of the CPI have evolved within the context of an index limited to market goods and services, and presumably the appropriate uses of an index that incorporated changes in crime levels, disease incidence, or income tax rates would be somewhat different from the current uses of the CPI.

²⁶ U.S. Senate, Committee on Finance, *Final Report*, p. 30.

²⁷ The commission's discussion of the appearance of AIDS, however, suggests agreement with the idea that not all changes in the quality of life ought to be reflected in the CPI (U.S. Senate, Committee on Finance, *Final Report*, p. 47).

In summary, the BLS has no specific plans to implement this recommendation. Measurement of changes in “quality of life” may require too many subjective judgments to furnish an acceptable basis for adjusting the CPI. Furthermore, it is unclear whether “quality of life” valuations are an appropriate part of an index of change in the price of market goods and services.

Recommendation xii. BLS should investigate the ramifications of the embedded assumption of price equilibrium and the implications of it sometimes not holding.

Any systematic method for distinguishing quality change from price change must be based on some theoretical framework and set of assumptions. In most cases the BLS, like academic economists who do research in this field, relies on one or another assumption about price equilibrium. An equilibrium assumption underlies hedonic methods for quality adjustment, for example, as well as the matched model price comparisons commonly used by the BLS.²⁸ Although virtually all systematic methods for quality adjustment are based to some extent on assumptions about price equilibrium, the nature of the assumptions differs between methods. Of the methods used for quality adjustment by BLS, two (the “overlap method” and the “link method”) are based on a particularly strict equilibrium assumption that quality differences can be inferred from the price differences between individual items.²⁹ The hedonic method, in contrast, allows for random deviations of prices from equilibrium values and may allow for differences in rates of price change between items of different vintages.

The commission recommends that the BLS investigate the assumption of price equilibrium that underlies certain quality adjustment and item substitution procedures. We agree that reducing reliance upon this assumption can sometimes make the CPI more accurate, particularly

²⁸ See Jack E. Triplett, “Concepts of Quality in Input and Output Price Measures: A Resolution of the User Value—*The U.S. National Income and Product Accounts: Selected Topics* (Chicago, University of Chicago Press, 1983).

²⁹ For discussion of the quality adjustment methods used by the BLS, see Armknecht, Lane, and Stewart, “New Marshall Reinsdorf, Paul Liegey, and Kenneth Stewart, “New Ways of Handling Quality Change in the U.S. Consumer Price Index,” Working Paper No. 276, Bureau of Labor Statistics, 1996 and Moulton and Moses, “Addressing the Quality Change Issue.”

for long run comparisons. Indeed, the BLS already has made considerable progress in doing this. Recent tabulations indicate that item replacements adjusted for quality using the methods that embody a strong price equilibrium assumption (i.e., the 'overlap method' and the 'link method') declined from about 2 percent of prices collected in 1983 to 0.62 percent in 1995.³⁰ In addition, the CPI for prescription drugs now reflects consumers' savings from buying therapeutically equivalent generic substitutes for branded products. We plan to continue research on avoiding bias from unwarranted price equilibrium assumptions.

In summary, the BLS agrees with this recommendation, has made considerable progress in reducing reliance on quality adjustment methods that require strong price equilibrium assumptions, and plans to continue research and progress in this area.

Recommendation xiii. The BLS will require a number of new data collection initiatives to make some progress along these lines. Most important, data on detailed time use from a large sample of consumers must be developed.

The final longer run recommendation is that the BLS should develop new data collection initiatives on time use and 'quality of life' issues. These data would support the research programs described in the commission's first longer run recommendation. We agree that time use data would be valuable to researchers, and we concur with the focus on using them for supplementary indicators rather than as part of the main cost-of-living framework. Accordingly the BLS has established a Time Use Working Group that is developing a set of recommendations for using the Current Population Survey (CPS) sample to conduct a survey of how individuals spend their time. The Group has been charged with developing a survey approach, and specifying sample size, data collection methodology, schedule and budget and staffing requirements. The report will be ready by mid-summer 1998.

³⁰ Moulton and Moses, "Addressing the Quality Change Issue," Table 4.

solve the fundamental measurement problems even in specific CPI components. Finally, the absence of systematic, well-accepted ways to deal with these problems also means that there are no rigorous ways to measure the new outlet or quality/new goods biases potentially created in the CPI.

In summary, the concluding statements of the BLS report to the House Budget Committee in April 1995 remain applicable today. The BLS is intensely aware of the sensitive nature of the data it produces, and of the critical need for these data to be as accurate as possible. It will continue to investigate the measurement issues that it and others have identified, and will introduce corresponding improvements to the index as quickly as it can.